

## Researchers offer safer high capacity batteries

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WRIGHT-PATTERSON AFB, Ohio — Air Force Research Laboratory's Propulsion Directorate has created a new generation of safer, high-capacity batteries for military applications.

Scientists have developed lithium-ion batteries that could solve safety problems in commercial equipment.

Enhanced capabilities of portable electronic equipment, such as laptop computers, increase the power demand on their batteries. As a result, equipment manufacturers have turned to the rechargeable lithium-ion battery to power high-end laptop computers, camcorders and wireless telephones. These batteries produce more power, and are light and last longer than their nickel-cadmium or nickel-metal hydride counterparts.

Certain lithium-ion batteries included in these devices have shown a tendency to erupt in flames when overheated, which prompted major manufacturers to issue recalls on thousands of laptop computers.

It seems the culprit is in the battery electrolyte—the current-carrying component in these batteries.

Many commercial lithium-ion batteries use a highly flammable solvent as part of the electrolyte. While providing the necessary current, there are some drawbacks. The most critical drawback occurs if the battery electrolyte oxidizes during charging causing the battery to short out and fail. This is due to what scientists call a narrow “electrochemical window.” Simply put, these high voltage lithium-ion batteries must have added electronic circuitry to keep voltages within a very narrow range to prevent oxidation and the resultant battery failure from occurring.

Propulsion Directorate researchers have developed lithium-ion batteries that use low melting point salt mixtures that are liquid at room temperature or lower. These natural electrolytes do not require solvents and have improved properties and very high conductivity. With this electrolyte, batteries can operate beyond the high temperatures experienced by military electronics. Not only do these batteries promise to be highly capable and flexible, but also quite a bit safer to the thousands of high-end consumer electronics users, as the electrolyte is non-flammable. Moreover, these electrolytes are inexpensive and environmentally benign. @